

City of Hudson



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Community Resilience Building Workshop Summary of Findings March, 2017

City of Hudson

Community Resilience Building Workshop

Summary of Findings

Overview

The need for municipalities, regional planning organizations, states and federal agencies to increase resilience and adapt to extreme weather events and mounting natural hazards is strikingly evident amongst the communities of the Hudson River Valley. Recent events such as Tropical Storms Irene and Sandy have reinforced this urgency and compelled leading communities like the City of Hudson to proactively plan and mitigate potential risks. Ultimately, this type of leadership is to be commended because it will reduce the exposure and vulnerability of Hudson's citizens, infrastructure and ecosystems and serve as a model for communities across the Hudson Valley, New York, and the Nation.

In the winter of 2016-17, with funding from the NYS DEC Hudson River Estuary Program Stewardship Grant Program, a partnership formed between the City of Hudson and The Nature Conservancy, Historic Hudson River Towns, and Hudson River Watershed Alliance that focused on increasing awareness of risks from natural and climate-related hazards, a municipal-based core team was established to advance a Community Resilience Building Workshop in February 2017. The core directive of this effort was to engage community stakeholders to facilitate the education, planning and ultimately, implementation of priority adaptation actions. The Workshop's central objectives were to:

- Define extreme weather and local natural and climate-related hazards.
- Identify existing and future vulnerabilities and strengths.
- Develop prioritized actions for the City and broader stakeholder networks.
- Identify opportunities for the community to advance actions to reduce risk and increase resilience.



The City of Hudson employed a unique “anywhere at any scale”, community-driven, workshop process called Community Resilience Building (CRB) (CommunityResilienceBuilding.com). The CRB’s Risk Matrix and various science-based tools were integrated into the workshop process to provide both decision-support and risk visualization for the City of Hudson. By employing the CRB Workshop process, rich with information, experiences, and dialogue the participants produced the findings catalogued in this summary report. This report provides an overview of the top hazards, current concerns and challenges, current strengths and vulnerabilities, and recommends actions to improve the City of Hudson’s resilience to natural and climate-related hazards today and in the future.

The summary of findings transcribed in this report, like any that concern the evolving nature of risk assessment and associated action, are proffered for comments, corrections and updates from workshop attendees and additional stakeholders alike. The City of Hudson’s leadership displayed herein will benefit from the continuous and expanding participation of all those concerned.

Summary of Findings

Top Hazards and Vulnerable Areas for City of Hudson

During the Community Resilience Building Workshop, community participants were asked to confirm the top natural hazards for the City of Hudson as identified by the core team in previous meetings. Flooding from intense storms and coastal storm surge along with sea level rise were identified as the hazards of greatest concern. In addition, inland and riverine flooding due to precipitation and subsequent runoff was identified as a top hazard for the City. Finally, environmental changes associated with climate change particularly periods of extended drought were also highlighted as major concerns for the City. These hazards have direct and increasing impacts on City residents and their neighborhoods and the City’s resources, natural areas (wetlands, watersheds, parks), roads, drinking and wastewater systems, and other critical infrastructure.



Top Hazards and Areas of Concern for City of Hudson

Top Hazards

- Coastal Flooding from Storm Surge and Sea Level Rise
- Inland Flooding due to Precipitation
- Severe Drought and Extreme Temperatures

Areas of Concern

Neighborhoods: Northside, Southside.

Ecosystems: North Bay, South Bay, Churchtown Reservoir, riparian corridors, coastal parks, urban street trees, forested watersheds around reservoirs.

Transportation: NYS RT 9G, Warren Street, intersection NYS RT 9G/3rd Street, Rossman Street, Prospect Street, Washington Street.

Infrastructure: Wastewater treatment plant and pump station, Amtrak station and tracks, correctional facility, schools, daycare facilities, Church Street Dam, DPW facility, Combined Sewer Overflow system, Front Street Industrial Area, I-1 on 2nd Street Extension, river-based public amenities.



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NWS



Current Concerns and Challenges Presented by Hazards

The City of Hudson has several concerns and faces multiple challenges related to the impacts of weather related events. In recent years, the City has experienced a series of highly disruptive and damaging weather events including Tropical Storm Irene (August 2011), Tropical Storm Sandy, (October 2012), and winter Nor'easter Nemo (February 2013). Impacts from Irene included significant coastal flooding, heavy-rain induced inland flooding, and wind damage. Sandy caused coastal flooding and extensive power outages across large portions of the City. Nemo dropped nearly three feet of snow on the City knocking out power and isolating residents and neighborhoods. The magnitude and intensity of these events across New York over the course of just 18 months has increased awareness of natural hazards along with climatic change and motivated communities like Hudson to comprehensively improve resilience both at the municipal, county, and regional level.

This series of extreme weather events highlighted that impacts from hazards are felt differently across the City from the low-lying coastal area to the forested uplands to east of the downtown. The western part of the City borders the Hudson River and is exposed to damage from coastal flooding and storm surge. The heavily forested eastern uplands experience the effects of tree damage from wind, snow, and ice as well as damage from inland flooding during heavy precipitation events. Longer periods of elevated heat, particularly in July and August, have raised concerns about the availability of drinking water for residents. The combination of these issues presents a challenge to emergency preparedness and response, and requires comprehensive yet tailored actions for establishing mitigation priorities for areas of the City.

The workshop participants were generally in agreement that the City of Hudson is experiencing more intense and frequent storms events. The impacts, particularly during Tropical Storm Irene, affected the daily activities of every resident. Coastal areas are experiencing greater impact from major storms and increases in average tidal ranges are resulting in routine flooding events in certain low lying places. Additionally, there was a general concern about the need and challenges of being prepared with contingency plans for worst case scenarios during different times of the year (i.e., major hurricanes (Cat-3 or above)) particularly in the late fall/winter versus summer due to more intense winter storms.



Specific Categories of Concerns and Challenges

Vulnerability of Road Network

One of the primary concerns expressed by participants was the vulnerability of the City's road network during and after routine and extreme events. Road closures prevent emergency management services from reaching stricken areas and reduce public access to evacuation routes and critical facilities like gas stations, grocery stores, and pharmacies. In addition, impassable roads can limit public access to sheltering facilities in the City.

It was clear at the Workshop that City residents are reliant on Route 9G which may at times become impassable due to flooding from the Germantown District to the western part of the City. One particularly problematic area which routinely experiences flooding is the intersection of Route 9G (state owned and maintained) and 3rd Street (city owned and maintained) resulting in temporary road closures.

Workshop participants expressed additional concerns over the steep elevation change from the hospital to the river and the routine clogging of storm drains results in flooding of multiple roads including Warren, Prospect, Rossman,



and Washington; particularly during extreme rain events. In effect, the development of previously wooded slopes has increased the impervious cover, and coupled with the elevation changes, render the current stormwater system inadequate to convey the volume of runoff downstream resulting in back-ups and surcharging that exacerbates flooding of critical intersections, roadways, and adjoining properties/right-of-ways.

Drinking Water Supply

One of the key concerns discussed in the workshop revolved around the City's drinking water supply system which is comprised of the Churchtown Reservoir, well field and a robust distribution system. A record is maintained by the Department of Public Works for each property connected to the potable water system but most connections



remain un-metered. The Department of Public Works did have an engineering report prepared in August 2014 regarding the stability of the reservoir dam however that report did not evaluate overall watershed conditions relative to the stability of the forested areas that drain into the reservoir. It was decided at the workshop that the complexity and interdependence of supply and delivery system required a focused working group to identify and prioritize the appropriate actions necessary to enhance the systems resiliency; particularly given the need to counter act the potential impact of more severe droughts, precipitation events and issues of forecasted sedimentation runoff into the reservoir.

Wastewater System

Similar to the drinking water system, the challenges posed in building resiliency into the City's waste water treatment plant and conveyance system are sophisticated enough to warrant a separate and focused discussion. Several reports are posted in the Public Works pages of the City's web site that can serve as a benchmark for further discussion on how best to address the elimination of the combined sewer conveyance system to eliminate sewer overflows into the Hudson River. The implementation of the Green Stormwater Retrofit Project along Upper Union Street is a good example of how sanitary system overflows can be reduced and can serve as a pilot for replication elsewhere in the City.

Railroad Station and Rail Line

While not directly under the control of the City of Hudson, the Metro North/Amtrak Railroad Station and associated rail line provide a critical artery for access to employment and to facilitate transportation along the Hudson River Valley between Albany and New York City. The City recognizes that the resilience of this asset is paramount to the long-term viability of their community. It was noted that this concern is shared by all the municipalities serviced on this rail system and beyond.

Formal Planning Capacity

One of the top challenges surfaced during the workshop was the lack of a key leadership position within the City's structure. This planning position could address the long term needs of the City and provide institutional knowledge and continuity as



elected administrations change. As of now, institutional knowledge only rests on a limited basis at the departmental level. The participants suggested that without this dedicated capacity the City is unable to fulfill some basic needs and is potentially

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missing out on opportunities to better coordinate, fund and align services to improve the quality of life of all residents. Recognized shortfalls include but are not limited to the lack of a city-wide emergency evacuation plan, an overarching multi-departmental sustainability and resilience plan, long term capital improvement plan for aging infrastructure, a green infrastructure plan, and an urban re-forestation program. While the impact of establishing the position of City Manager

should not be overestimated, it was the sentiment of the participants that the position could be instrumental in aligning the long term needs of the City and engage its residents in a more coordinated and collaborative approach.

Communications

There was a universal recognition amongst the participants that there is an immediate need to convene and coordinate a broad stakeholder effort in hopes of both fostering a sense of community and to initiate the development of a communications plan. The current fragmentation of stakeholders across the City was highlighted as the principal concern of leadership. The initiation of an engagement process that would begin a community dialogue within a framework to develop a holistic communications plan and website was viewed as paramount. The participants noted that additional capacity in the form of a City Manager to span across the different departments and engage stakeholder groups throughout the City could help to satisfy this need.

Coastal and Riparian Wetlands

One of the key challenges raised during the Workshop is the lack of awareness amongst residents of the benefits and importance (including flood storage and prevention) provided by wetlands as well as the lack of knowledge regarding regulations in place for wetland protection. The larger concern is that the wetlands are not being recognized and valued as part of the natural infrastructure that helps reduce risk and improve resilience for the City.



Emergency Management

There was a concern raised about the lack of full time emergency management professionals at both the county and city level. This deficiency has resulted in the lack of an integrated county-scale evacuation plan that could integrate with the eventual development of a city-wide plan. The lack of full-time staff is accentuated by the declining level of volunteers involved with critical services as those provided by the Fire Department.

Current Strengths and Assets in City of Hudson

Because of the recent experiences with extreme weather, the City is well acquainted with their existing strengths within the community. In addition, the long-term cooperative practices between the county and municipalities have resulted in routine upgrades to an overall emergency response plan and response exercises for the emergency management professionals. Reinforcing and expanding these supportive practices and exercises will generate greater benefits to the community through increased preparedness against future storms of greater frequency and intensity, as well as develop plans for improved resiliency in dealing with increases in storm surge, sea level rise, temperature, precipitation, and drought.

- Clearly, the responsive and committed leadership by the elected officials is a very much appreciated strength in the City.
- The City has solid, highly experienced, emergency management professionals with access to adequate resources in times of need. The overarching coordination amongst various departments including Police, Fire, and EMS was cited as ongoing community strengths. Mutual aid agreements coupled with robust sheltering facilities across the county were highlighted as existing and ongoing strengths.
- Intact forested watersheds surrounding the reservoirs serve to maintain water quality and quantity for City residents. Also, Hudson has large tracts of undeveloped upland forests which protect local water quality and provide water storage services that replenish the aquifers. Other park land and open space provide public amenities that contribute to the overall quality of life.



- Recent upgrades to the wastewater treatment facility, pump station and numerous other engineering upgrades were identified as projects that have improved the City’s resilience.
- Supportive social services such as the activities and transportation systems for seniors, youth and families, as well as faith-based organizations were highlighted as important community assets.
- The salt marshes, floodplains, inland wetlands, and open space along the coast and inland areas offer increased defense against storms through surge attenuation, inland flooding storage, and capture for surface runoff infiltration. Without these natural resources in place, the City’s coastal and inland infrastructure and homes would suffer greater damage and higher ongoing costs to rebuild or relocate.

Top Recommendations to Improve Resilience in Hudson

A common thread throughout the workshop discussions was the recognition that the City and residents need to be better prepared through longer term community-based, contingency planning across key areas of concern. This and additional core highlights are addressed below.

Highest Priority

- Need to create a sustainability plan for emergency management that addresses retention of volunteers and the need for full time emergency management staff. While there is a robust and informed emergency management structure with routine preparedness efforts, there is a lack of fulltime emergency management professionals at the City and County level.
- Work with County emergency management professionals, planning staff, and elected officials to create a county level evacuation plan that integrates local municipal efforts and resources.



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CRB Workshop Recommendations for Hudson

Highest Priority

- Continue to advocate for regional dialogue between municipalities-county-railroad officials to find immediate and longer term solutions to ongoing and anticipated future flooding events at the train station and along portions of the rail line.
- Develop a Green Infrastructure Plan to reduce flooding of roads due to precipitation-driven runoff as well as alleviate stress on the City's storm water conveyance systems.
- Initiate a comprehensive review of the stability and viability of existing drinking water supply infrastructure, including primary and secondary supply sources and distribution system.
- City to work with County and NYS DOT representatives to design and install emergency evacuation route signage along with user-friendly maps to be integrated into City's Evacuation Plan and on its website.
- Need to generate a comprehensive, coordinated communications plan for the City to foster greater community engagement and social cohesion amongst interested residents and existing stakeholder and civic groups.
- Look to foster dialogue across City in hopes of developing a more robust social support network; Examine opportunity to identify community center to foster establishment of community-based outreach, support, and educational networks for all residents; Identify leaders to initiate efforts in collaboration with Mayor's office.
- Initiate educational outreach on importance of long term wetland preservation and maintenance as impacted by climate change and look for ways to integrate this information into the City's Local Waterfront Revitalization Plan (LWRP) and Natural Resource Inventory planning efforts.



CRB Workshop Recommendations for Hudson

Moderate Priority

- Examiner long term flood proofing or relocation options of at-risk residential buildings and neighborhoods within the City; particularly for Southside and Northside neighborhoods. Look to best practices and experts from other municipalities for guidance.
- Modify building codes for residential, commercial, and industrial structures to require elevation of homes significantly damaged by natural disasters to help minimize impacts from subsequent events.
- Reevaluate immediate and longer term implications of coastal and inland flooding on existing structures and proposed redevelopment; particularly the Front Street Industrial Area and the I-1 on 2nd Street Extension.
- Integrate sustainable-resilient flood proofing options and storm runoff retention on-site (if not already required) into redevelopment plans.
- Develop effective ongoing inventory and response approach to ensure proper support for vulnerable populations in the City before, during, and after disasters.
- Initiate dialogue on culvert upgrades - feasibility and implementation - to increase flushing and long viability of tidal marsh systems; particularly the South and North Bay.
- Re-examine historic conditions in state statute and other mandates that currently preclude more progressive watershed management approaches. Seek to modify existing constraints posed by outdated policy to help enhance resilience at watershed scale across City.
- Look to identify and integrate preferred watershed management practices to enhance resilience for the City into current Natural Resource Inventory and other open space update efforts in the future.



CRB Workshop Recommendations for Hudson

Lower Priority

- At the wastewater treatment plant and associated infrastructure, continue to plan for future higher water events and annually review emergency management plans.
- Review existing contingency plans for the Department of Public Works facility and fuel depot. Initiate efforts to identify temporary relocation site(s) during major storm events.



South Western View of Hudson City N.Y. from Academy Hill, or Prospect Hill (1837) by W.H. Bartlett



CRB Workshop Participants: Department/Committee and Position

Name	Department/Committee	Position
Melissa Auf Der Maur*	Owner/Director	Basilica Hudson
Michael O'Hara*	City of Hudson Common Council	Alderman 1st ward
Nick Zachos*	Waterfront Advisory Committee	Chair
Tiffany Martin Hamilton*	City of Hudson Executive	Mayor
Tiffany Gariga	City of Hudson Common Council	Alderman 2nd ward
Lisa Walsh	City of Hudson Mayor's Office	
Sheena Salvino*	Hudson Development Corporation	Director
Rob Perry*	City of Hudson DPW	Superintendent
George Keeler	Hudson School District	Facilities Supervisor
Craig Haigh*	City of Hudson Code Enforcement	Code Enforcement officer
Tom Depietro	Hudson Planning Board	Chair
Bill Vanslyke	Columbia Memorial Hospital	Facilities Supervisor
Ed Moore	Hudson Police Department	Chief
Kaya Weidman	Kites Nest	Director
JR Heffner	A Colarusso and Sons	VP Operations
C.J. Randall	Randal West	Partner
Christine Vanderlan*	Columbia Land Conservancy	Community Projects Manager
Scott Davis	Hudson Powerboat Assoc.	Member/ ambassador
Ben Ezinga	Sustainable Community Assoc.	Partner
Bob Pinto	Columbia County Facilities	Director
William Black	Columbia County Emergency Services	Director
Jonathon Lerner*	Hudson CAC	
Henry Schwartz*	Columbia County Emergency Services	Deputy Director

*Attendee.



CRB Workshop Project Team: Organization and Role

The Nature Conservancy:

Andrew Peck, PhD (Project Lead-Principal Contact) (apeck@tnc.org)

Adam Whelchel, PhD (Lead Facilitator)

Sheila Webb-Halpern (Facilitator)

Rebecca Shirer (Natural Resource Navigator)

Cara Lee (Facilitator/Support)

Ellen Weiss (Support)

Historic Hudson River Towns:

Jerry Faiella (Support)

Hudson River Watershed Alliance:

Maureen Cunningham (Facilitator)

Scenic Hudson:

Nava Tabak (Sea Level Rise Mapper and Marsh Migration)

Acknowledgements

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Appendix

Base Map and Participatory Mapping Exercise Outputs

Supporting Resources Presented at Workshop



Supporting Resources Presented at Workshop

Slide #1: These projections were all based on data provided by the New York Climate Change Science Clearinghouse (<http://climate-dev.library.cornell.edu/>) and based on the average of seven climate models using the A2 emissions scenario, generalized to the HUC8 watershed.

Changes in climate by 2050

Summer max temperature	+4.6 degrees F
Winter min temperature	+6.2 degrees F
Days below freezing	27 fewer days
Annual total precip	+1.7 inches
Winter precip	+1 inch
Summer precip	-0.2 inches

Slide #2: Data from the Northeast Regional Climate Center (<http://www.nrcc.cornell.edu/>) with results being based on average estimates for 2040-2069 using A2 emissions scenario.

Vulnerability to flooding

- flood events in county (1954-2013) = 54
- residential properties in the 100yr floodzone = 12
- 7 (58%) of those properties have NFIP policies
- \$ paid in NFIP claims = \$2915
- Repetitive losses = 0

Slide #3: Number of properties in the floodzone is an estimate based on GIS analysis of parcel data and FEMA maps; local information may be more accurate.

Changes in climate by 2050: extreme precipitation

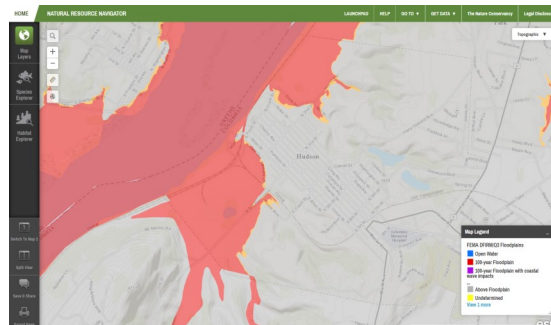
	10-yr Event	100-yr Event
Current event rainfall	3.9"	6.8"
Future event rainfall	4.3"	7.2"
% increase in rainfall	11.2%	6.2%
Future recurrence interval of current rainfall amount	6 years	77 years



Supporting Resources Presented at Workshop

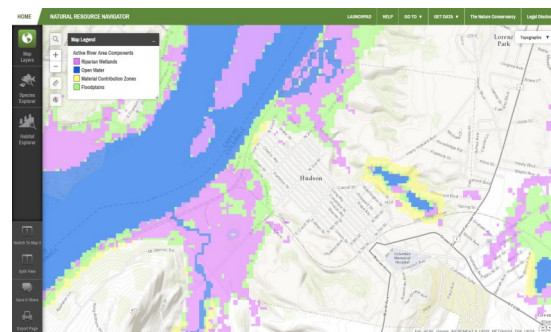
Slide #4: FEMA DFIRM and Q3 floodplains where available for NY State. Areas of the state without data shown here may have paper FIRM maps delineating floodplains and flood risks, but the data is currently not available in digital form - <https://goo.gl/PNy8TD>.

FEMA 100-yr floodplain



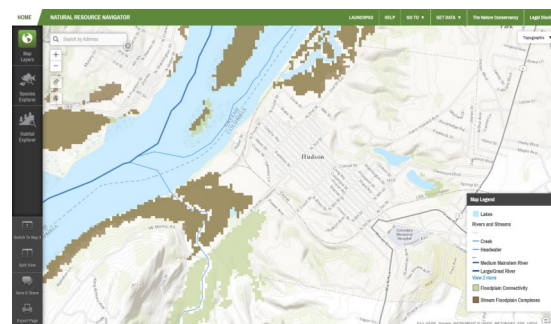
Slide #5: Active River Area largely corresponds to FEMA floodplains, but may include additional areas that have the potential to be flooded based on topography. The yellow 'material contribution zones' are based on fixed width buffering and do not necessarily flood. <https://goo.gl/2VC9mg>

Active River Area



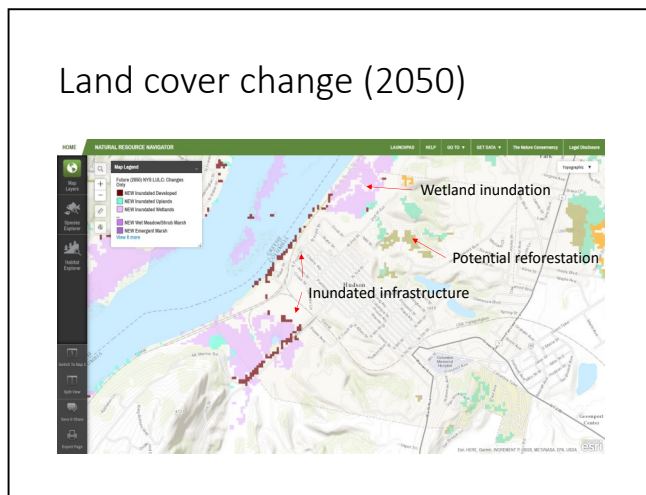
Slide #6: These are areas within the Active River Area and are either contiguous with the waterway (lighter green) or are part of a large complex of undeveloped floodplain. These areas should remain undeveloped. <https://goo.gl/duWPof>

Functional floodplains

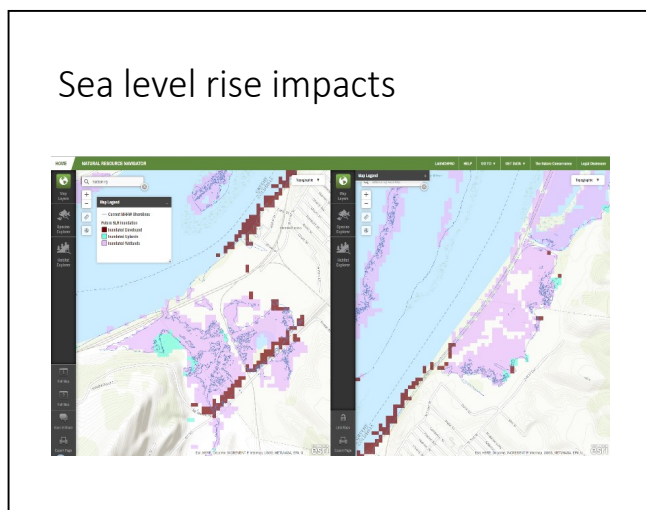


Supporting Resources Presented at Workshop

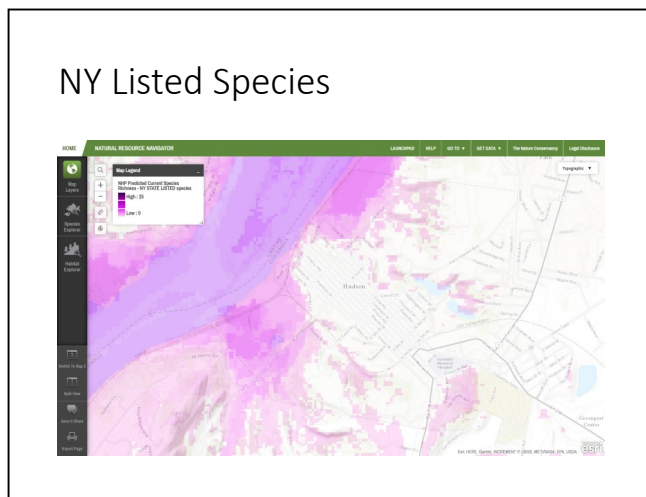
Slide #7: Land cover change is based on 18" sea level rise projections from Scenic Hudson. Areas of potential reforestation were identified based on analysis of past patterns of land cover change.



Slide #8: Wetlands with future inundation may remain as wetlands or may transition to open water or another type of wetland (forested to emergent wetlands, for example). Likewise, the future fate of inundated upland natural and agricultural habitats, whether they transition to a wetland state or to open water, depends on a number of factors not modeled. Inundated developed areas (maroon) will be increasingly prone to frequent flooding and may require heavy investment in engineered solutions to maintain current uses; otherwise some kind of rezoning or conversion to open space may need to be considered.

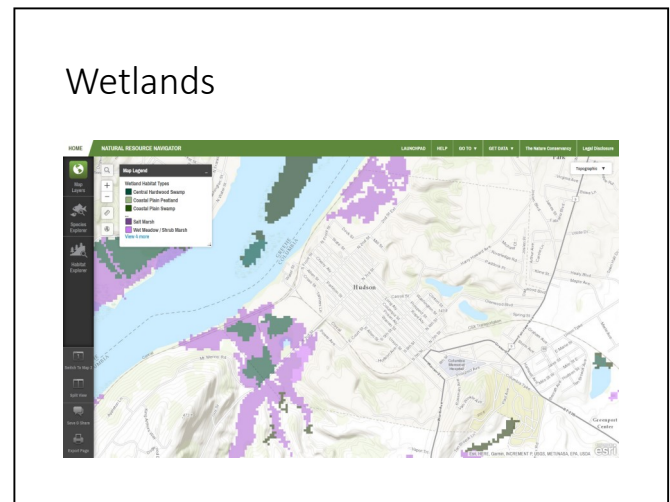


Slide #9: The number of state-listed species expected to be present based on models of suitable habitat developed by the NYNHP. Darker colors indicate areas more likely to have one or more species present that require special consideration for permitting.



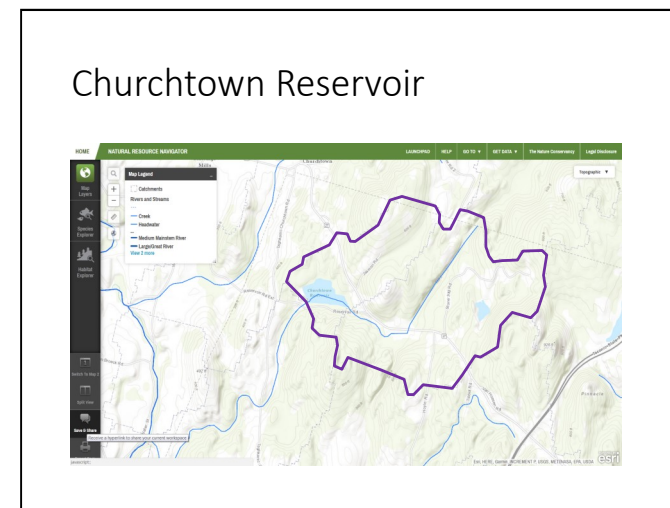
Supporting Resources Presented at Workshop

Slide #10: Wetland areas around Hudson, NY that are large enough to be regulated.

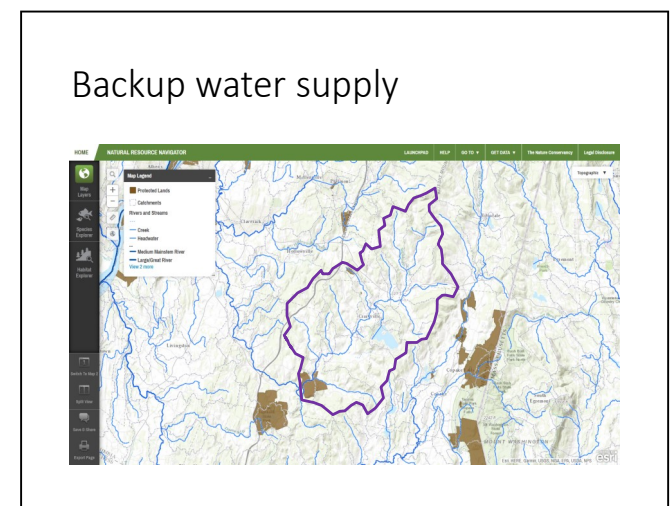


Slide #11: Reservoir itself is predicted to have slightly impacted biological water quality with up-stream segment threatened based on 303d data and classification. Watershed forest currently has invasive species and deer browse impacts along with risks from pests and pathogens. No land cover change expected between present day and 2050. High decline in canopy species is expected due to loss of tree age and species diversity. <https://goo.gl/flQQar>

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Slide #12: Biological water quality prediction is projected to be slightly impaired. Potentially future challenges associated with flow alteration and stream connectivity. Stream climate sensitivity is classified as moderately high. <https://goo.gl/9omgPT>



Supporting Resources Presented at Workshop

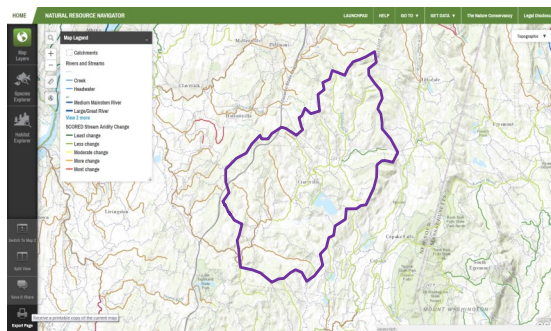
Slide #13: Projected impacts to water supply in City of Hudson.

Projected impacts to water supply

- Reservoir and backup supply predicted to have slightly impacted WQ
- Upstream of reservoir Threatened (303d)
- Forest has regeneration and invasives problems
- Risk of canopy loss from pests and pathogens
- Risk of climate declines in canopy species
- No land cover change expected
- Moderate risk of increased drought

Slide #14: The Aridity Index is a metric of moisture stress in a system (lower aridity index represents higher moisture stress) and is calculated from precipitation and Potential Evapotranspiration (PET). PET represents the water that an ecosystem could potentially use through evaporation and transpiration. PET is higher with warmer temperatures and more daylight hours. A positive change indicates that water stress is predicted to be lower in the future, while negative values indicate greater water stress under climate change. This area is predicted to have mild to moderate (compared to the rest of NY) increases in water stress under the A2 emissions by 2050. This indicates the possibility decreased water quality as well as decreased water quantity.

Increased aridity



Slide #15: Percent loss of basal area from all pest and pathogen species, from 2013-2027, modeled by USDA National Insect and Disease Risk Map. These projections do not take climate exacerbation of pest risk into account.

Pest and pathogen risk

